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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/740,103	12/18/2000	Erik W. Jensen	884.386US1	5261

7590 03/25/2003

Schwegman, Lundberg
Woessner & Kluth, P.A.
P.O. BOX 2938
Minneapolis, MN 55402

EXAMINER
ALCALA, JOSE H

ART UNIT	PAPER NUMBER
2827	

DATE MAILED: 03/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/740,103	JENSEN, ERIK W.	
	Examiner	Art Unit	
	Jose H Alcala	2827	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12/26/02* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-5 and 21-40* is/are pending in the application.

4a) Of the above claim(s) *38-40* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-5 and 21-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12/18/00* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *13* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the hyperbolic taper of claim 25, the triangular conductors of claim 28, the exponential taper of claim 32, the square conductors of claim 34, and the hexagonal conductors of claim 36 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 3 and 4 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Regarding Claim 3, the recitation: "at least one of the at least two vias is coupled to the pad by a conductive segment", is giving space to the possibility that all of "the at

least two vias" are coupled to the pad by a conductive segment, which is not supported in the drawings or in the specification.

Regarding Claim 4, the recitation: "only two of the three vias are coupled to the substantially straight edges", is giving space to the possibility that the via that is substantially beneath the pad is coupled to the substantially straight edges of the conductive segment, which is not supported in the drawings or in the specification.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

4. Claim 2 is rejected under 35 U.S.C. 102(e) as being anticipated by Memis (US Patent No. 6,162,997).

Memis teaches an interconnect comprising: a substrate (Reference numbers 12,13,14); a pad (Reference number 20) formed on the substrate; and at least two vias (Reference number 21,26) coupled to the pad, wherein only one (Reference number 21) of the at least two vias is formed substantially beneath the pad.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Memis (US Patent No. 6,162,997) in view of Badet et al. (US Patent No. 4,371,744). As best understood by the examiner:

Regarding Claim 3, Memis teaches all the elements of the instant claimed invention as stated supra for claim 2, but fails to teach that at least one of the at least two vias is coupled to the pad by a conductive segment having a first end having a first width and a second end having a second width, the first end being connected to the at least one of the at least two vias and the second end being connected to the pad, and the first width being less than the second width. Badet teaches a conductive segment (Reference number 12) that connects a chip to a pad located on a substrate, having a first end having a first width and a second end having a second width, and the first width being less than the second width. It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Memis and Badet, in order to have the first end of the conductive segment of Badet being connected to the at least one of the at least two vias and the second end being connected to the pad, taught by Memis. Thus, by connecting the pad to the via, through

the outside of the substrate, it is easier to repair or modify the circuit functions without removing the chip component.

7. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Memis (US Patent No. 6,162,997) in view of Goenka et al. (US Patent No. 4,371,744). As best understood by the examiner:

Regarding Claim 4, Memis teaches all the elements of the instant claimed invention as stated supra for claim 2, but fails to teach that the pad has at least five substantially straight edges and the at least two vias comprise three vias and only two of the three vias are coupled to the substantially straight edges. Goenka teaches that the pad has at least five substantially straight edges (reference number 41) and they are connected to each other and to other elements from the straight edges. It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Memis and Goenka in order to have a pad having at least five substantially straight edges and being coupled by them to the vias, thus reducing the rate of undercutting of the pad significantly, minimizing the risk of delamination. Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to increase the number of vias connected to the pad in order to be able to transmit more electrical or thermal energy between the chip and a printed circuit board. In addition, it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. See St. Regis Paper Co. v. Bemis Co., 193 USPQ 8.

8. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Memis (US Patent No. 6,162,997) in view of Goenka et al. (US Patent No. 4,371,744), and further in view of Frei et al. (US Patent No. 5,342,999). As best understood by the examiner:

Regarding Claim 5, Memis as modified by Goenka, teaches all the elements of the instant claimed invention as stated supra for claim 4, but fails to teach that at least one of the only two of the three vias coupled to the substantially straight edges is coupled to one of the substantially straight edges through a tapered conductive segment. Frei teaches a tapered conductive segment (the conductor reference number 70, at the top-leftmost part of Figure 13) coupling a via to substantially straight edges of a pad (Reference number 68). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Memis, Goenka and Frei, in order to have at least one of the only two of the three vias coupled to the substantially straight edges is coupled to one of the substantially straight edges through the Frei tapered conductive segment, thus effectively and reliably connect the pad and the vias, without having to have a bigger pad, reducing the material used and in that way reducing the cost of manufacture.

9. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Memis (US Patent No. 6,162,997) in view of Barrow (US Patent No. 5,706,178).

Regarding Claim 21, Memis teaches all the elements of the instant claimed invention as stated supra for claim 2, but fails to explicitly teach that the pad comprises copper. Goenka teaches pads (Reference number 22) made of copper (column 2, lines 58 and 59). It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the pad comprising copper, to improve the conductivity of the pad and the transmission of current, and increasing the peel strength of the pads.

Regarding Claim 22, Memis teaches that at least two vias (Reference number 21 and 26) comprise cylindrical conductors.

10. Claims 23,29,35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Memis (US Patent No. 6,162,997).

Regarding Claims 23,29 and 35, Memis teaches an interconnect comprising: a substrate (Reference numbers 12,13,14); a pad (Reference number 20) formed on the substrate; and at least two vias (Reference number 21,26) coupled to the pad, wherein only one (Reference number 21) of the vias is formed substantially beneath the pad. Memis fails to explicitly teach that there are at least three, four, or five vias coupled to the pad, wherein only one of the at least three, four, or five vias, is formed substantially beneath the pad. It would have been obvious to one having ordinary skill in the art at the time the invention was made to increase the number of vias connected to the pad in order to be able to transmit more electrical or thermal energy between the chip and a printed circuit board. In addition, it has been held that mere duplication of the essential

working parts of a device involves only routine skill in the art. See St. Regis Paper Co. v. Bemis Co., 193 USPQ 8.

11. Claims 24,and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Memis (US Patent No. 6,162,997) in view of Frei et al. (US Patent No. 5,342,999). As best understood by the examiner:

Regarding Claim 24, Memis teaches all the elements of the instant claimed invention as stated supra for claim 23, but fails to explicitly teach that at least one of the at least three vias is coupled to the pad by a tapered conductive segment. Frei teaches a tapered conductive segment (the conductor reference number 70, at the top-leftmost part of Figure 13) coupling a via to substantially straight edges of a pad (Reference number 68). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Memis and Frei, in order to have at least one of the only two of the three vias coupled to the substantially straight edges is coupled to one of the substantially straight edges through the Frei tapered conductive segment, thus effectively and reliably connect the pad and the vias, without having to have a bigger pad, reducing the material used and in that way reducing the cost of manufacture.

Regarding Claim 30, Memis teaches all the elements of the instant claimed invention as stated supra for claim 29, but fails to teach at least three of the at least four vias is coupled to the pad by a tapered conductive segment. Frei teaches a tapered conductive segment (the conductor reference number 70, at the top-leftmost part of

Figure 13) coupling a via to substantially straight edges of a pad (Reference number 68). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Memis and Frei, in order to have at least three of the at least four vias coupled to the pad by using the Frei tapered conductive segments, thus effectively and reliably connecting the pad and the vias, without having to have a bigger pad, reducing the material used and in that way reducing the cost of manufacture.

12. Claims 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Memis (US Patent No. 6,162,997) in view of Frei et al. (US Patent No. 5,342,999), and further in view of Barrow (US Patent No. 5,706,178).

Regarding Claim 25, Memis as modified by Frei teaches all the elements of the instant claimed invention as stated supra for claim 24, but fails to explicitly teach that the tapered conductive segment comprises copper. Goenka conductive segments (reference number 32) made of copper (column 2, lines 58 and 59). It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the tapered conductive segment comprising copper , to improve the conductivity of the segment and the transmission of current, and increasing the peel strength of the conductor.

13. Claims 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Memis (US Patent No. 6,162,997) in view of Frei et al. (US Patent No. 5,342,999), and further in view of Murayama (US Patent No. 3,725,743).

Regarding Claim 31, Memis as modified by Frei, fails to explicitly teach that the tapered conductive segment comprises aluminum. Murayama teaches conductive segments 9reference number 14) made of aluminum. It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the tapered conductive segment comprising aluminum, to have the conductive segment made of a high conductive and high workability material.

14. Claims 26,27 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Memis (US Patent No. 6,162,997) in view of Frei et al. (US Patent No. 5,342,999), and further in view of Sasaoka et al. (US Patent No. 6,010,769). As best understood by the examiner:

Regarding Claim 26, Memis as modified by Frei teaches all the elements of the instant claimed invention as stated supra for claim 25, but fails to explicitly teach that the tapered conductive segment comprises a hyperbolic taper. Sasaoka teaches a tapered conductive segment comprising a hyperbolic taper (Reference number 14 in Figure 4). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Memis,Frei and Sasaoka in order to make the tapered conductive segment comprising a hyperbolic taper, thus improving

the reliability of the connection by making the interconnect more resistant to stress applied during manufacturing.

Regarding Claim 27, Frei teaches that the pad comprises gold.

Regarding Claim 32, Memis as modified by Frei teaches all the elements of the instant claimed invention as stated supra for claim 31, but fails to explicitly teach that the tapered conductive segment comprises an exponential taper. Sasaoka teaches a tapered conductive segment comprising an exponential taper (See Figure 11B). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Memis,Frei and Sasaoka in order to make the tapered conductive segment comprising an exponential taper, thus improving the reliability of the connection by making the interconnect more resistant to stress applied during manufacturing.

15. Claims 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Memis (US Patent No. 6,162,997) in view of Frei et al. (US Patent No. 5,342,999), and further in view of Sasaoka et al. (US Patent No. 6,010,769) and Arima et al. (US Patent No. 5,375,042).

Regarding Claim 33, Memis as modified by Frei and Sasoka, fails to explicitly teach that the pad comprises tungsten. Arima teaches a pad (reference number 24) comprising tungsten. It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the pad comprising tungsten, in order to be

able to reduce the width of the pad, due to the high density of the material, improving integration.

16. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Memis (US Patent No. 6,162,997) in view of Frei et al. (US Patent No. 5,342,999), and further in view of Sasaoka et al. (US Patent No. 6,010,769) and Kondo et al. (US Patent No. 6,043,986). As best understood by the examiner:

Regarding Claim 28, Memis as modified by Frei and Sasaoka teaches all the elements of the instant claimed invention as stated supra for claim 27, but fails to explicitly teach that each of the at least two vias comprise triangular conductors. Kondo teaches in figure 5, vias comprising triangular conductors. It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Memis, Frei, Sasaoka and Kondo in order to have each of the at least two vias comprising triangular conductors, in order to improve the thermal conductivity of the interconnect by effectively radiating the heat generated from the circuit elements.

17. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Memis (US Patent No. 6,162,997) in view of Frei et al. (US Patent No. 5,342,999), and further in view of Sasaoka et al. (US Patent No. 6,010,769) and Mancini (US Patent No. 3,601,750). As best understood by the examiner:

Regarding Claim 34, Memis as modified by Frei and Sasaoka teaches all the elements of the instant claimed invention as stated supra for claim 33, but fails to explicitly teach that each of the at least four vias comprise square conductors.

Mancini teaches in figure 1, vias comprising square conductors. It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Memis, Frei, Sasaoka and Mancini in order to have each of the at least two vias comprising square conductors, in order to assure an uniform electrical conduction by having a uniform cross section.

18. Claims 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Memis (US Patent No. 6,162,997) in view of Frei et al. (US Patent No. 5,342,999), and further in view of Murayama (US Patent No. 3,725,743).

Regarding Claim 31, Memis as modified by Frei, fails to explicitly teach that the tapered conductive segment comprises aluminum. Murayama teaches conductive segments 9reference number 14) made of aluminum. It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the tapered conductive segment comprising aluminum, to have the conductive segment made of a high conductive and high workability material.

19. Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Memis (US Patent No. 6,162,997) in view of of Murayama (US Patent No. 3,725,743).

Regarding Claim 36, Memis fails to explicitly teach that the pad comprises silver. Murayama teaches a pad (reference number 14) made of silver (column 2, lines 49 and 50). It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the pad comprising silver, in order to improve the conductivity of the pad.

Silver is a very well known material and is used in the art for conductors of all sorts, such as pads, for its excellent electrical and thermal conducting properties. It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the pad comprising silver, to have a highly conductive material as the pad. In addition, it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

20. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Memis (US Patent No. 6,162,997) in view of Kondo et al. (US Patent No. 6,043,986). As best understood by the examiner:

Regarding Claim 37, Memis teaches all the elements of the instant claimed invention as stated supra for claim 36, but fails to explicitly teach that each of the at least five vias comprises hexagonal conductors. Kondo teaches in figure 6, vias comprising hexagonal conductors. It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Memis and Kondo in order to have each of the at least five vias comprising hexagonal conductors,

in order to improve the thermal conductivity of the interconnect by effectively radiating the heat generated from the circuit elements.

Response to Arguments

21. Applicant's arguments with respect to claims 2-5,21-37 have been considered but are moot in view of the new ground(s) of rejection.

As per applicant's argument that "a plated through hole is not a via", examiner respectfully disagrees and points out that the term: "through hole" is commonly used in the art to label vias that go through a layer, such as the ones of the instant claimed invention.

As per Applicant's argument that the office action: "fails to provide specific, objective evidence of record to support a finding of a suggestion or motivation to combine reference teachings". Examiner respectfully disagrees and points out that the suggestion or motivation to combine reference teachings are either mentioned in the references or were well known in the art at the time the invention was made, and are explicitly pointed out in the last action. For example in the rejection of claim 31, the motivation for the modification of the combination of the references is explicitly pointed out in the rejection. It is well known in the art the good conductive properties of aluminum and its use as a conductor due to those properties. The fact that the aluminum material is lightweight is added in order to support the choice and desirability of that material for the invention, not because that is the most common reason to select a material for making a conductor.

Applicant, further argues that "the office action also states that several claims were the result of mere design choices and therefore obvious", and notes that "the cases cited were not in the art of designing interconnects and are therefore inapplicable". Examiner respectfully disagrees, the references used to reject those claims belong to the same art (printed circuit boards), therefore they are in the field of applicant's endeavor, making the rejection proper. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992).

Conclusion

22. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following references teach some of the elements of the instant claimed invention: Grinberg et al. (US Patent No. 4,275,410), Fuchs (US Patent No. 5,355,019), Pasch (US Patent No. 5,468,681) and Goldstein (US Patent No. 5,528,080).

23. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jose H Alcala whose telephone number is (703) 305-9844. The examiner can normally be reached on Monday to Friday.

24. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Talbott can be reached on (703) 305-9883. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3431 for regular communications and (703) 305-3431 for After Final communications.

25. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

JHA
March 23, 2003

David A. Zarneke
AU 2827